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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/830,540	04/26/2001	Frank Kowalewki	1587	9344
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Striker Striker & Stenby 103 East Neck Road Huntington, NY 11743			EXAMINER DEAN, RAYMOND S	
			ART UNIT 2684	PAPER NUMBER

DATE MAILED: 01/26/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/830,540

Applicant(s)

KOWALEWKI, FRANK

Examiner

Raymond S Dean

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 October 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 29 - 45 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 29 - 45 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 April 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
 - 2) ☐ Certified copies of the priority documents have been received in Application No. _____.
 - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 1004.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Response to Arguments

1. Applicants' may not request that any objection to the drawings be held in abeyance (See CFR 1.85(a)) thus applicants' must submit new corrected drawings to avoid abandonment of the application.
2. Applicant's arguments filed October 12, 2004 have been fully considered but they are not persuasive.

Regarding The Anticipation Rejections:

Examiner respectfully disagrees with the applicants' assertion that Antonio (US 6,519,456) does not teach or suggest a system in which a single base station includes means for transmitting signals over two or more separate channels to a single mobile station. Antonio teaches a CDMA system that conducts softer handoff (See Column 3 lines 50 – 53, Column 3 line 67, Column 4 lines 1 – 4). A wireless system that conducts softer handoff will comprise a mobile station that simultaneously receives signals on more than one channel from different sectors of the same base station thus Antonio teaches a single base station that includes means for transmitting signals over two or more separate channels to a single mobile station. Antonio also teaches plural antennas of the first radio station (See Figure 5).

It is well known in the art that IIR filters used for pre-equalization in a wireless RF system take into account the properties of all the RF channels used for communication

such that a total impulse response of all said channels can occur thereby enabling channel estimation. The channel properties comprise RF bandwidth. The orthogonal codes in a CDMA system, along with the information being transmitted, modulate the RF carrier thereby directly setting the RF bandwidth thus said codes are also a part of the channel properties. The IIR filters will thus take into account the transmission properties of all the used radio channels and codes.

Examiner agrees with applicants' assertion that Antonio does not teach performing an estimate of a total impulse response of the plural radio channels based on superimposed reference signals received over the plural channels from the second radio station. Antonio, however, does teach performing an estimate of the total impulse response of the plural radio channels. Antonio teaches a base station comprising modulators, which comprise IIR filters. The IIR filters, as set forth above, determine the total impulse response of the channels that are used. Zhuang, however, teaches a DFE that generates tap coefficients for channel estimation. The DFE needs a training sequence or reference signal to generate said tap coefficients thus there is an inherent reference signal. Zhuang also teaches a TDMA system, which means that there will be multiple channels. There will be a reference signal or training sequence associated with each channel thus enabling the tap coefficients to be generated thereby enabling channel estimation (See Figure 1, Section II lines 3 – 9). The total of the training sequences or reference signals lead to a total of the tap coefficients which further lead to the total channel estimation. The only way that the training sequences or reference signals can be totaled is by superimposing said training sequences or reference signals.

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Antonio and Zhuang teach a multiple access wireless radio system that incorporates pre-equalization at the base station thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the reference signal method taught above in Zhuang in the wireless system of Antonio for the purpose of enabling proper channel estimation of the reverse link thus allowing the forward link signal to be properly pre-equalized.

Regarding The Obviousness Rejections:

Examiner respectfully disagrees with the applicants' assertion that Antonio does not teach or suggest transmitting signals from a single base station to a single mobile station via plural radio channels for same reasons as set forth above. Examiner agrees with applicants' assertion that Karlsson does not teach or suggest transmitting signals from a single base station to a single mobile station via plural radio channels. Karlsson, however, does teach a radio station comprising at least two antennas for receiving and transmitting signals over corresponding radio channels (See Column 5 lines 45 – 48, Column 5 lines 66 – 67, the wireless system is bi-directional); means for multiplying respective received/transmitted signals from/to said at least two antennas with corresponding coefficients (c_1 , c_2) to form weighted received/transmitted signals; means for adding said weighted received signals to form a resulting linear combination; means for selecting said corresponding coefficients (c_1 , c_2) and means for inputting said resulting linear combination to a demodulator (See Figure 3, Column 6 lines 24 – 34, since this is a mobile phone used in a CDMA system there is an inherent demodulator). Antonio and Karlsson both teach a CDMA system with mobile stations

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thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the plurality of antennas along with the weighting method taught in Karlsson on the mobile station of Antonio for the purpose of suppressing the interference associated with signals transmitted from other base stations as taught by Karlsson. Examiner also agrees with applicants' assertion that Zhuang does not teach or suggest a system in which a single base station transmits signals over two or more separate channels to a single mobile station. Zhuang, however, does teach reference signals (See Discussion of Zhuang set forth above). Antonio in view of Karlsson and Zhuang teach a multiple access wireless radio system that incorporates pre-equalization at the base station thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the reference signal method taught above in Zhuang in the wireless system of Antonio in view of Karlsson for the purpose of enabling proper channel estimation of the reverse link thus allowing the forward link signal to be properly pre-equalized.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 29 – 30, 39 – 40, and 45 are rejected under 35 U.S.C. 102(e) as being anticipated by Antonio et al. (US 6,519,456 B2).

Regarding Claim 29, Antonio teaches a radio station (1) comprising at least two antennas (50,55) from which pre-equalized signals are propagated over respective radio channels (20,25) to an additional radio station (2) (Figure 1, Figure 5, Column 5 lines 5 – 7, Column 12 lines 13 – 17, this is a CDMA system that conducts softer handoff, which means that a mobile station will simultaneously receive signals on more than one channel from different sectors of the same base station); a code generator (5) for widening data transmitted with the pre-equalized signals with a respective code, said code generator ascertaining said respective code according to a selected radio link (Column 11 lines 45 – 51); and a modulator (4) including means for pre-equalization of radio signals to be transmitted to form the pre-equalized signals (Figure 5, Figure 6, Column 12 lines 13 – 17, the modulator (114) comprises an IIR filter for pre-equalization); wherein said means for pre-equalization of said radio signals to be transmitted from said at least two antennas (50, 55) performs said pre-equalization according to all actually used codes and transmission properties of all actually used ones of said radio channels (20,25) (Column 12 lines 13 – 17, the IIR filters used for pre-equalization in a wireless RF system take into account the properties of all the RF channels used for communication such that a total impulse response of all said channels can occur thereby enabling channel estimation, the channel properties comprise RF bandwidth, the orthogonal codes in a CDMA system, along with the

information being transmitted, modulate the RF carrier thereby directly setting the RF bandwidth thus said codes are also a part of the channel properties, the IIR filters will thus take into account the transmission properties of all the used radio channels and codes).

Regarding Claim 30, Antonio teaches all of the claimed limitations recited in Claim 29. Antonio further teaches at least one channel estimator (11,12) and wherein said at least one channel estimator comprises means for determining an estimate of an impulse response of each of said radio channels (20,25) and said pre-equalization of said radio signals to be transmitted from said at least two antennas occurs according to said estimate of said impulse response for each of said radio channels (Figure 5, Column 5 lines 5 – 7, Column 12 lines 13 – 17, since the IIR estimates the channel impulse response there is an inherent channel estimator).

Regarding Claim 39, Antonio teaches a method for transmitting signals between a first radio station (1) and a second radio station (2), said first radio station comprising a modulator (4) with pre-equalization means (Figure 1, Figure 5, Figure 6, Column 12 lines 13 – 17, the modulator (114) comprises an IIR filter for pre-equalization), said method comprising the steps of: performing a pre-equalization of radio signals to be transmitted in said modulator of said first radio station in order to form pre-equalized signals (Figure 5, Column 12 lines 13 – 17); transmitting said pre-equalized signals from the first radio station over each of a plurality of radio channels (20,25) to the second radio station (2) (Figure 5, Column 5 lines 5 – 7, this is a CDMA system that conducts softer handoff, which means that a mobile station will simultaneously receive signals on

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more than one channel from different sectors of the same base station); receiving said pre-equalized signals transmitted over each of said radio channels (20,25) in the second radio station (Figure 1, Figure 5, Column 12 lines 13 – 17, since the signal will be pre-equalized at the base station the mobile station will receive a pre-equalized signal); transmitting other signals over additional channels from other radio stations (3) to the first radio station (1) (Figure 1); and widening data transmitted from different radio stations including the other radio stations with different codes (Figure 1, Column 11 lines 45 – 47, the PN codes are mixed with the data, said mixed signal modulates the carrier such that the resulting transmitted signal is a spread spectrum signal); wherein said pre-equalization in said modulator (4) of said radio station is performed according to all of said different codes and according to transmission properties of all of said radio channels and said additional channels (Figure 5, Column 12 lines 13 – 17, the IIR filters used for pre-equalization in a wireless RF system take into account the properties of all the RF channels used for communication such that a total impulse response of all said channels can occur thereby enabling channel estimation, the channel properties comprise RF bandwidth, the orthogonal codes in a CDMA system, along with the information being transmitted, modulate the RF carrier thereby directly setting the RF bandwidth thus said codes are also a part of the channel properties, the IIR filters will thus take into account the transmission properties of all the used radio channels and codes).

Regarding Claim 40, Antonio teaches all of the claimed limitations recited in Claim 39. Antonio further teaches performing an estimate of an impulse response of

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each of said radio channels (20,25) in said first radio station (1) (Column 12 lines 13 – 17, the IIR filters used for pre-equalization in a wireless RF system take into account the properties of all the RF channels used for communication such that a total impulse response of all said channels can occur thereby enabling channel estimation), and wherein said pre-equalized signals are propagated from plural antennas (50,55) of the first radio station (1) and transmitted over said plurality of said radio channels (20,25) to the second radio station (2) (Figure 1, Figure 5), said pre-equalization of said signals propagated from said plural antennas (50,55) is performed according to said estimate of said impulse response (Column 12 lines 13 – 17).

Regarding Claim 45, Antonio teaches all of the claimed limitations recited in Claim 39. Antonio further teaches wherein said transmission properties of said radio channels and said additional channels are ascertained from data transmissions of the second radio station and the additional radio stations to the first radio station (Figure 1, Column 12 lines 13 – 17, the IIR filters used for pre-equalization in a wireless RF system take into account the properties of all the RF channels used for communication such that a total impulse response of all said channels can occur thereby enabling channel estimation, the channel properties comprise RF bandwidth, the orthogonal codes in a CDMA system, along with the information being transmitted, modulate the RF carrier thereby directly setting the RF bandwidth thus said codes are also a part of the channel properties, the IIR filters will thus take into account the transmission properties of all the used radio channels and codes).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 31 – 32, 35, and 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Antonio et al. (US 6,519,456 B2) in view of Karlsson et al. (6,167,039).

Regarding Claim 31, Antonio teaches a method for transmitting signals between a first radio station (1) and a second radio station (2), said first radio station including a modulator (4) with pre-equalization means (Figure 1, Figure 5, Figure 6, Column 12 lines 13 – 17, the modulator (114) comprises an IIR filter for pre-equalization), said method comprising the steps of: performing a pre-equalization of radio signals to be transmitted in said modulator of said first radio station in order to form pre-equalized signals (Figure 5, Column 12 lines 13 – 17); transmitting said pre-equalized signals from the first radio station over each of a plurality of radio channels (20,25) to the second radio station (2) (Figure 5, Column 5 lines 5 – 7, this is a CDMA system that conducts softer handoff, which means that a mobile station will simultaneously receive signals on more than one channel from different sectors of the same base station); receiving said pre-equalized signals transmitted over each of said radio channels (20,25) in the

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second radio station, said pre-equalized signals transmitted over respective channels being received in said second radio station by a corresponding antenna of said second radio station (2) (Figure 1, Figure 5, Column 12 lines 13 – 17, since the signal will be pre-equalized at the base station the mobile station will receive a pre-equalized signal); determining an estimate of a total impulse response of all of said radio channels (20,25) in said first radio station (1) (Column 12 lines 13 – 17, the IIR filters used for pre-equalization in a wireless RF system take into account the properties of all the RF channels used for communication such that a total impulse response of all said channels can occur thereby enabling channel estimation); wherein said pre-equalization of said radio signals is performed by said modulator (4) according to said estimate of said total impulse response determined in step d) (Figure 5, Column 12 lines 13 – 17).

Antonio does not teach a second radio station with a plurality of antennas.

Karlsson teaches a second radio station with a plurality of antennas (Column 5 lines 66 – 67).

Antonio and Karlsson both teach a CDMA system with mobile stations thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the plurality of antennas taught in Karlsson on the mobile station of Antonio for the purpose of suppressing the interference associated with signals transmitted from other base stations.

Regarding Claim 32, Antonio in view of Karlsson teaches all of the claimed limitations recited in Claim 31. Karlsson further teaches wherein received signals received by said antennas (60,65) of said second radio station (2) are combined linearly

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and subsequently input to a demodulator for demodulation (Figure 3, Column 6 lines 24 – 34, since this is a mobile phone used in a CDMA system there is an inherent demodulator).

Regarding Claim 35, Antonio in view of Karlsson teaches all of the claimed limitations recited in Claim 31. Antonio further teaches transmitting additional radio signals to said first radio station (1) from additional radio stations (3), and wherein data transmitted with said additional radio signals from said additional radio stations are widened with different codes (Figure 1, Column 11 lines 45 – 47, the PN codes are mixed with the data, said mixed signal modulates the carrier such that the resulting transmitted signal is a spread spectrum signal) and said pre-equalization is performed in said modulator (4) of said first radio station (1) according to all of said different codes and transmission properties of all of said radio channels (Column 12 lines 13 – 17, the IIR filters used for pre-equalization in a wireless RF system take into account the properties of all the RF channels used for communication such that a total impulse response of all said channels can occur thereby enabling channel estimation, the channel properties comprise RF bandwidth, the orthogonal codes in a CDMA system, along with the information being transmitted, modulate the RF carrier thereby directly setting the RF bandwidth thus said codes are also a part of the channel properties, the IIR filters will thus take into account the transmission properties of all the used radio channels and codes).

Regarding Claim 42, Antonio teaches all of the claimed limitations recited in Claim 39. Antonio further teaches performing an estimate of an impulse response of

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each of said radio channels (20,25) in said first radio station (1) (Column 12 lines 13 – 17, the IIR filters used for pre-equalization in a wireless RF system take into account the properties of all the RF channels used for communication such that a total impulse response of all said channels can occur thereby enabling channel estimation), and wherein said pre-equalized signals propagated by the first radio station are transmitted over said plurality of said radio channels (20,25) and received by a corresponding antenna of said second radio station (2) (Figure 1, Figure 5), said pre-equalization of said signals propagated from said first radio station (1) is performed according to said estimate of said impulse response (Column 12 lines 13 – 17).

Antonio does not teach wherein received signals received by said corresponding antennas (60,65) of said second radio station (2) are combined linearly and subsequently input to a demodulator.

Karlsson further teaches wherein received signals received by said corresponding antennas (60,65) of said second radio station (2) are combined linearly and subsequently input to a demodulator (Figure 3, Column 6 lines 24 – 34, since this is a mobile phone used in a CDMA system there is an inherent demodulator).

Antonio and Karlsson both teach a CDMA system with mobile stations thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the plurality of antennas and linear combination method taught in Karlsson in the mobile station of Antonio for the purpose of suppressing the interference associated with signals transmitted from other base stations.

7. Claims 33 – 34, 36 – 38, and 43 – 44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Antonio et al. (US 6,519,456 B2) in view of Karlsson et al. (6,167,039) as applied to Claims 32, 35, 42 above, and further in view of Zhuang et al. (Vehicular Technology Conference, 1995 IEEE 45th, Volume: 1, 25 – 28 July 1995 Pages: 206 – 210 Vol. 1).

Regarding Claim 33, Antonio in view of Karlsson teaches all of the claimed limitations recited in Claim 32. Antonio further teaches transmitting a signal from an antenna of said second radio station (2) over each of said radio channels (20,25) to said first radio station (1) (Column 5 lines 5 – 7, this is a CDMA system that conducts softer handoff, which means that a mobile station will simultaneously receive and transmit signals on more than one channel from/to different sectors of the same base station).

Antonio in view of Karlsson does not teach a reference signal and wherein said estimate of said total impulse response is derived from superimposed reference signals received in said first radio station.

Zhuang teaches a reference signal (Section II lines 5 – 9, the DFE needs a training or reference signal in order to generate the tap coefficients thus there is an inherent reference signal) and wherein said estimate of said total impulse response is derived from superimposed reference signals received in said first radio station (Section II lines 3 – 5, since this is a TDMA system there will be multiple channels and thus there will be a reference signal associated with each said channel thus enabling the tap coefficients to be generated thereby enabling channel estimation, the total of the training sequences or reference signals lead to a total of the tap coefficients which

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further lead to the total channel estimation, the only way that the training sequences or reference signals can be totaled is by superimposing said training sequences or reference signals).

Antonio in view of Karlsson and Zhuang teach a multiple access wireless radio system that incorporates pre-equalization at the base station thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the reference signal method taught above in Zhuang in the wireless system of Antonio in view of Karlsson for the purpose of enabling proper channel estimation of the reverse link thus allowing the forward link signal to be properly pre-equalized.

Regarding Claim 34, Antonio in view of Karlsson and in further view of Zhuang teaches all of the claimed limitations recited in Claim 33. Zhuang further teaches wherein said respective reference signal is multiplied with a corresponding coefficient depending on which of said radio channels is employed in transmitting said reference signal and said corresponding received reference signal is multiplied with said corresponding coefficient of said radio channel employed for transmitting said reference signal (Section II lines 5 – 9).

Regarding Claim 36, Antonio in view of Karlsson teaches all of the claimed limitations recited in Claim 35. Antonio in view of Karlsson does not teach wherein said transmission properties of said radio channels are determined from said data transmitted to the first radio station (1) from said additional radio stations and from additional data transmitted to the first radio station from the second radio station (2).

Zhuang teaches wherein said transmission properties of said radio channels are determined from transmitted data transmitted to the first radio station (1) from the second radio station (2) and said additional radio stations (3) (Figure 1, Section II lines 3 – 9, since this is a TDMA system there will be multiple channels and multiple radio stations).

Antonio in view of Karlsson and Zhuang teach a multiple access wireless radio system that incorporates pre-equalization at the base station thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the properties of the radio channels taught above in Zhuang in the wireless system of Antonio in view of Karlsson for the purpose of enabling proper channel estimation of the reverse link thus allowing the forward link signal to be properly pre-equalized.

Regarding Claim 37, Antonio teaches a radio station comprising an antenna for receiving and transmitting radio signals transmitted over corresponding radio channels from another radio station (Column 5 lines 5 – 7, this is a CDMA system that conducts softer handoff, which means that a mobile station will simultaneously receive and transmit signals on more than one channel from/to different sectors of the same base station) and means for transmitting respective signals to said another radio station from said antenna over said corresponding radio channels (Column 5 lines 5 – 7, this is a CDMA system that conducts softer handoff, which means that a mobile station will simultaneously receive and transmit signals on more than one channel from/to different sectors of the same base station).

Antonio does not teach a radio station (2) with at least two antennas, wherein respective weighted reference signals are formed by multiplying respective reference signals by corresponding coefficients assigned to said at least two antenna, and so that said respective weighted reference signals are transmitted from corresponding antenna associated with said respective coefficients; means for multiplying corresponding received signals from said at least two antenna with said respective coefficients (c_1 , c_2) to form weighted received signals; means for adding said weighted received signals to form a resulting linear combination; and means for inputting said resulting linear combination to a demodulator.

Karlsson teaches a radio station (2) comprising at least two antennas (60,65) for receiving and transmitting radio signals transmitted over corresponding radio channels (Column 5 lines 45 – 48, Column 5 lines 66 – 67); means for transmitting respective weighted signals, wherein said weighted signals are formed by multiplying respective signals by corresponding coefficients assigned to said at least two antennas (Figure 3, Column 6 lines 24 – 30, the communication links between the mobile station and the base station is bi-directional thus the weighting method will also be used for transmitting signals), and so that said respective weighted signals are transmitted from corresponding antennas associated with said respective coefficients (Figure 3, Column 6 lines 24 – 30, the communication links between the mobile station and the base station is bi-directional thus the weighting method will also be used for transmitting signals); means for multiplying respective received signals from said at least two antennas with corresponding coefficients (c_1 , c_2) to form weighted received signals

(Figure 3, Column 6 lines 24 – 30); means for adding said weighted received signals to form a resulting linear combination (Figure 3, Column 6 lines 24 – 30); means for selecting said corresponding coefficients (c_1 , c_2) and means for inputting said resulting linear combination to a demodulator (Figure 3, Column 6 lines 24 – 30, since this is a mobile phone used in a CDMA system there is an inherent demodulator).

Antonio and Karlsson both teach a CDMA system with mobile stations thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the plurality of antennas along with the weighting method taught in Karlsson on the mobile station of Antonio for the purpose of suppressing the interference associated with signals transmitted from other base stations.

Antonio in view of Karlsson does not teach reference signals.

Zhuang teaches a reference signal (Section II lines 5 – 9, the DFE needs a training or reference signal in order to generate the tap coefficients thus there is an inherent reference signal).

Antonio in view of Karlsson and Zhuang teach a multiple access wireless radio system that incorporates pre-equalization at the base station thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the reference signal method taught above in Zhuang in the wireless system of Antonio in view of Karlsson for the purpose of enabling proper channel estimation of the reverse link thus allowing the forward link signal to be properly pre-equalized.

Regarding Claim 38, Antonio teaches a radio station (1) comprising a modulator (4) comprising means for pre-equalization of radio signals to be transmitted to a second

radio station (2) so as to form pre-equalized signals (Figure 1, Figure 5, Figure 6, Column 12 lines 13 – 17, the modulator (114) comprises an IIR filter for pre-equalization); means for transmitting said pre-equalized signals over each of a plurality of radio channels (20,25) to said second radio station (2), said second radio station having an antenna corresponding to said plurality of said radio channels (Figure 1, Column 5 lines 5 – 7, this is a CDMA system that conducts softer handoff, which means that a mobile station will simultaneously receive signals on more than one channel from different sectors of the same base station); and means for performing an estimate of a total impulse response of said radio channels (20,25) from respective signals received over said radio channels from said second radio station (Column 12 lines 13 – 17, the IIR filters used for pre-equalization in a wireless RF system take into account the properties of all the RF channels used for communication such that a total impulse response of all said channels can occur thereby enabling channel estimation); wherein said means for pre-equalization performs said pre-equalization according to said estimate of said total impulse response of said plurality of said radio channels (Figure 5, Column 12 lines 13 – 17).

Antonio does not teach a second radio station with a plurality of antennas.

Karlsson teaches a second radio station with a plurality of antennas (Column 5 lines 66 – 67).

Antonio and Karlsson both teach a CDMA system with mobile stations thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the plurality of antennas taught in Karlsson on the mobile station of Antonio

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for the purpose of suppressing the interference associated with signals transmitted from other base stations.

Antonio in view of Karlsson does not teach reference signals.

Zhuang teaches a reference signal (Section II lines 5 – 9, the DFE needs a training or reference signal in order to generate the tap coefficients thus there is an inherent reference signal).

Antonio in view of Karlsson and Zhuang teach a multiple access wireless radio system that incorporates pre-equalization at the base station thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the reference signal method taught above in Zhuang in the wireless system of Antonio in view of Karlsson for the purpose of enabling proper channel estimation of the reverse link thus allowing the forward link signal to be properly pre-equalized.

Regarding Claim 43, Antonio in view of Karlsson teaches all of the claimed limitations recited in Claim 42. Antonio in view of Karlsson does not teach wherein respective reference signals are transmitted to said first radio station (1) over said plurality of said radio channels (20,25) and said estimate of said total impulse response is derived from said respective reference signals in said first radio station.

Zhuang teaches wherein a respective reference signals are transmitted to said first radio station (1) from a corresponding antenna (60) of said second radio station over a plurality of radio channels (Figure 1, Section II lines 3 – 9, the DFE needs a training or reference signal in order to generate the tap coefficients thus there is an inherent reference signal, since this is a TDMA system there will be multiple channels)

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and said estimate of said total impulse response is derived from said respective reference signals in said first radio station (Figure 1, Section II lines 3 – 9).

Antonio in view of Karlsson and Zhuang teach a wireless multiple access radio system that incorporates pre-equalization at the base station thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the reference signal method taught above in Zhuang in the wireless system of Antonio in view of Karlsson for the purpose of enabling proper channel estimation of the reverse link thus allowing the forward link signal to be properly pre-equalized.

Regarding Claim 44, Antonio in view of Karlsson and in further view of Zhuang teaches all of the claimed limitations recited in Claim 43. Karlsson further teaches wherein respective signals are multiplied by corresponding coefficients according to which of said radio channels is used for transmission of said respective signals (Figure 3, Column 6 lines 24 – 30, the communication links between the mobile station and the base station is bi-directional thus the weighting method will also be used for transmitting signals) and wherein said received signals received by said corresponding antennas (60, 65) of said second radio station (2) are multiplied by said corresponding coefficients and then linearly combined with each other (Figure 3, Column 6 lines 24 – 30). Zhuang further teaches reference signals (Section II lines 5 – 9, the DFE needs a training or reference signal in order to generate the tap coefficients thus there is an inherent reference signal).

8. Claim 41 is rejected under 35 U.S.C. 103(a) as being unpatentable over Antonio et al. (US 6,519,456 B2) in view of Zhuang et al. (Vehicular Technology Conference, 1995 IEEE 45th, Volume: 1, 25 – 28 July 1995 Pages: 206 – 210 Vol. 1).

Regarding Claim 41, Antonio teaches all of the claimed limitations recited in Claim 40. Antonio does not teach wherein a respective reference signal is transmitted to said first radio station (1) from a corresponding antenna (60) of said second radio station (2) over a plurality said radio channels (20,25) and said estimate of said impulse response of said plurality of said radio channels (20,25) is derived from reception of said respective reference signal transmitted over said radio channels (20,25) to said first radio station.

Zhuang teaches wherein a respective reference signal is transmitted to said first radio station (1) from a corresponding antenna (60) of said second radio station (2) over a plurality of radio channels (Figure 1, Section II lines 3 – 9, the DFE needs a training or reference signal in order to generate the tap coefficients thus there is an inherent reference signal, since this is a TDMA system there will be multiple channels) and said estimate of said impulse response of said radio channels is derived from reception of said respective reference signal transmitted over said radio channels to said first radio station (Figure 1, Section II lines 3 – 9).

Antonio and Zhuang teach a wireless multiple access radio system that incorporates pre-equalization at the base station thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the reference signal method taught above in Zhuang in the wireless system of Antonio for the purpose of

enabling proper channel estimation of the reverse link thus allowing the forward link signal to be properly pre-equalized.

Conclusion

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Raymond S Dean whose telephone number is 703-305-8998. The examiner can normally be reached on 7:00-3:30.

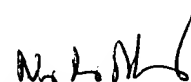
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nay A Maung can be reached on 703-308-7745. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Raymond S. Dean
January 20, 2005



NAY MAUNG
SUPERVISORY PATENT EXAMINER